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SCIENCE NEWS LETTER

TECHNOLOGY DEPT.

THE WEEKLY SUMMARY OF CURRENT SCIENCE

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See Page 286

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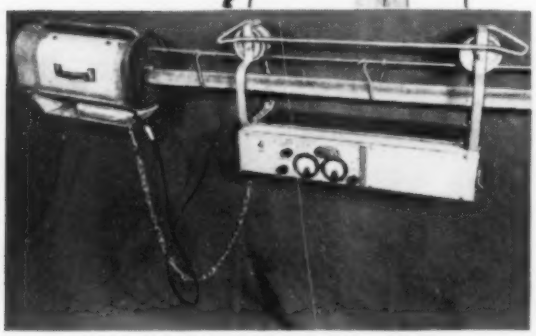
A SCIENCE SERVICE PUBLICATI

This electronic nose sniffs out leaks

Starting electronic nose on its way. It is pulled from pole to pole by line extending toward the ground. Previously workmen had to paint the cable with soap solution, so bubbles would disclose leaks.



For test, the cable is cleared of protective nitrogen or air, and filled with Freon gas. Case at left collects escaping gas which operates Freon-sensitive detector underneath. At points where Freon escapes through sheath cracks, the box at right—a combined control unit and power supply—rings a bell. Workmen mark the point of leak for later repair.

AFTER years of buffeting by the wind, even tough telephone cable sometimes shows its age. Here and there the lead sheath may crack from fatigue or wear through at support points. Before moisture can enter to damage vital insulation, leaks must be located and sealed.

To speed detection, scientists at Bell Laboratories constructed an electronic nose which *sniffs* out the leaks. Using an electrically operated element developed by the General Electric Company, the device detects leaks of as little as 1/100 cubic foot per day. Sheath inspection can be stepped up to 120 feet per minute.

Thus Bell scientists add findings in other fields to their own original research in ways to make your telephone system serve you better. On the other hand their discoveries are often used by other industries. Sharing of scientific information adds greatly to the over-all scientific and technological strength of America.

BELL TELEPHONE LABORATORIES

Improving telephone service for America provides careers for creative men in scientific and technical fields

PHYSIOLOGY

Antibiotics for the Starving

A pinch of penicillin or aureomycin added to the rice bowl in China, India and other hungry lands may stretch scanty proteins and save lives.

➤ THE MOLD remedies, such as penicillin and aureomycin, have a new future with "unlimited" possibilities.

They may be the way to give millions of the world's half-starved, undernourished peoples health and strength for happy lives, instead of their present miserable existence.

A pinch of penicillin or aureomycin added to the rice bowl in China, India and other rice-eating regions might solve a large part of the world's food problem and through this contribute to world peace.

This suggestion appeared in a report by Dr. Olaf Mickelsen of the National Institute of Arthritis and Metabolic Diseases, Bethesda, Md., to the American Dietetic Association meeting in Minneapolis.

Large numbers of people throughout the world live on all-vegetable, or meatless, diets, he pointed out. But the proteins from vegetables and plant foods, such as cereal grains, are not quite enough to keep people well nourished. Some animal protein, whether meat, eggs, fish, milk or poultry, is needed in addition.

Antibiotics, recent experiments show, have a protein-sparing action. That means that a little bit of fish or meat in the diet would go farther in terms of nourishment if an antibiotic was added to the diet.

In India and other parts of the Orient where rice makes up most of the day's food, the antibiotics might be particularly useful, it appears.

The experiments in Dr. Mickelsen's laboratory were done with rats fed a rice diet. These animals grew almost as well on the rice diet supplemented with vitamins, minerals, and small amounts of threonine and lysine as rats on the stock colony diet if penicillin or aureomycin were added to the diet. Threonine and lysine are two amino acids which the body uses to build protein and are essential ones which the body must have.

Heretofore, the nourishing effect of the antibiotics has been considered a growth-promoting and weight-increasing effect. This has led to extensive use of antibiotics in poultry and swine feeding.

Scientists have not had any explanation for this growth-stimulating effect. The experiments with the rats, made by Dr. Louis J. Pecora in Dr. Mickelsen's laboratory, show that at least in this case the growth-promoting antibiotics seem to act by sparing proteins.

"The implications and possibilities of this work in human nutrition are unlimited," Dr. Mickelsen declared.

"Further investigations will reveal its value as a supplement for the all-vegetable diets which, even today, are the exclusive diets of large numbers of people."

Science News Letter, November 1, 1952

JAPANESE FIGHTER—This rocket-launching "Defender" will be the first military plane built by the Japanese since the war.

PHYSIOLOGY

Tests Effect of Force on Muscles

➤ A SPECIAL instrument to test the effect of sudden, unexpected forces on muscles under tension has been devised by John Lyman and Donald Skilling of the department of engineering at the University of California at Los Angeles.

Its practical application is expected to be in the design of controls for jet planes, where sudden forces occurring at high speeds may cause pilots to lose control of the plane. It could also be related to artificial limbs research where compensation for loss of muscle sense must be developed.

The device will be used to study fundamental characteristics of the muscle sense and its relationship to other senses. Unexpected forces exerted upon muscles will be tested in three ways:

One situation involves maintaining a constant position of a lever in the face of varying forces. A second reverses this procedure. The third situation is a series of tracking problems involving the relationship of muscle, visual, auditory and tactile senses. In one phase of this situation the tactile sense will be blocked with drugs in an effort to establish the relationship between the muscle sense and sense of touch.

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AERONAUTICS

Japan Plans to Build Military Airplane

➤ A JAPANESE aircraft company has contracted with an American concern to build the scrappy little rocket-launching FD-25 "Defender" for sale to non-Communist countries of the Far East. It will be the first military airplane the Japanese have built since World War II.

Wendell S. Fletcher, president of the Fletcher Aviation Corp., Pasadena, Calif., said that the maneuverable little plane is to be built by the Toyo Aircraft Company of Tokyo on a production arrangement with Fletcher. A prototype of the FD-25 plus the necessary drawings have been cleared by the Department of State for transfer to Japan.

Statistics: The FD-25 is armed with two 30-caliber machine guns and 1,000 rounds of ammunition for each gun. It carries four 5-inch rockets or 40 2¾-inch rockets in clusters. It can use roads and ball parks for landing fields. Fully loaded, it can take off in 500 feet, climb 1,000 feet a minute and land in 330 feet. The plane was designed especially to support ground forces as a rocket launcher and fire-bomb carrier.

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ENGINEERING

Atomic Pipe Cleaner

➤ WHEN A pipe-cleaning "pig" was recently stuck in a new oil pipe-line being constructed in southern Ontario, atomic energy in the form of cobalt 60, a radioactive isotope, was used to free the metal object, adding a new atomic energy use.

A pipe-cleaning pig is a metal and rubber spool, which looks like an axle with two rubber covered wheels. It is the diameter of the pipe which it is cleaning and it is sent on its way through the pipe by liquid or air pressure. Its travel through the pipe-line clears away obstructions. When stuck in a long pipe-line laid underground, it is hard to locate and costly to free.

In building the pipe-line near London, Ontario, numerous "pigs" became stuck in the pipe, but one caused special difficulty. It had been fitted with a metal chain to which was attached a clanking cowbell, so that engineers on the surface could follow its travel as air pressure forced it along underground. When after four days they could not find it, they called on the Canadian government for some cobalt 60, being made at Canada's atomic energy plant at Chalk River, Ontario.

A vial of cobalt 60, the size of a .300 bullet, was sealed in one end of a metal "pig" and the "pig" was shot through the pipe with air pressure. On the surface, engineers followed it with Geiger counter and scintillometer. The air pressure developed in front of the "pig" with the cobalt 60 vial forced the first "pig" to start on its way. Engineers heard the unmusical clanging of the cowbell beneath their feet. Then both "pigs" became stuck, as noted by the Geiger counter and scintillometer. Air valves in front and behind the stuck "pigs" were closed till pressure was built up to 100 pounds. Then all valves were opened. The two "pigs" covered the remaining three and a quarter miles in six minutes, just under 30 miles an hour. They came hurtling out of the pipe-line, the "pig" with the cowbell landing 60 feet away from the terminal, the "pig" with the cobalt 60 soaring to a height of 50 feet and ending its flight out of the pipe 200 yards away. The cobalt 60 vial was still located in the second "pig" and was returned to the Chalk River plant, its job completed.

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PHYSICS

Synchro-Cyclotron Patent

➤ A PATENT has been granted for the synchro-cyclotron, one of the most powerful of atom-smashers. The inventor is Dr. Edwin M. McMillan, professor of physics at the University of California.

The synchro-cyclotron gets around Einstein's theory of relativity which works to slow down the particles hurled at atoms once they have achieved high energies.

The patent was granted despite acknowledgment by Dr. McMillan of an independent development of the synchro-cyclotron by a Russian scientist, V. Veksler. News of the Russian development appeared in a letter by Dr. Veksler in the American Physical Review, early in 1946.

The patent was apparently granted because no specific description of the Russian synchro-cyclotron had appeared in any publication available to the Patent Office prior to Dr. McMillan's application.

The University of California, back in 1946, set to work building a 300 million electron volt synchro-cyclotron with the cooperation of the Manhattan District, forerunner of the Atomic Energy Commission. Dr. Veksler had announced that Russia was building one with only 30 million electron volts of power.

As the energy of particles in an ordinary cyclotron increases, their mass also increases, in accordance with the theory of relativity, and they tend to slow down. This gets them out of phase with the regularly-spaced, high-frequency electrical pushes they get and thus they slow down even more.

Dr. McMillan discovered that, by increasing the magnetic field of the machine's electromagnet as the particles reach higher energies, he can jerk lagging projectiles up to the acceleration point exactly in time to receive a new push.

With the synchro-cyclotron, speeds of particles approaching the speed of light have already been achieved.

Dr. McMillan received patent number 2,615,129, which he assigned to the Atomic Energy Commission.

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PATHOLOGY

Finding Death Clue May Require Pathologist

➤ THE ONLY key to solution of a mystery shooting may be the evidence found in the victim's body by the doctor trained in pathology, Dr. Lester Adelson of Cleveland declared at the meeting of the American Society of Clinical Pathology in Chicago.

Dr. Adelson is a pathologist in the office of the Cuyahoga County, Ohio, coroner's office.

A complete autopsy, or post mortem examination, must be done in gunshot cases, he said. Bullets can and do perform erratically, he explained. Examination of entrance and exit wounds is not enough for reconstructing the direction of fire or assuming the probable cause of death. The whole track of the bullet through the body must be explored to see if there is alteration or deflection in its course and the injuries that caused death must be seen.

Some other wounds, such as icepick stabs, often resemble bullet wounds. Home-made guns may produce bizarre effects that will deceive anybody but a careful, experienced observer. For these reasons, Dr. Adelson said, the pathologist is needed to determine whether death was due to gunshot injuries as well as whether the victim was dead of other causes when he was shot.

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AWARDED NOBEL PRIZE—In 1940, Dr. Selman A. Waksman, of Rutgers University, showed this plate to members of the National Academy of Sciences meeting in Washington. It shows one of his early experiments in obtaining germ killers from the soil. At that time the* SCIENCE NEWS LETTER *(May 4, 1940) reported: "Conquest of the entire world of disease-producing germs seems possible as a result of the discovery . . . of germs in garden and field soil which destroy disease germs of the gram-negative group. Disease germs of the gram-positive group can also be destroyed by chemicals extracted from germs found in soil."

MICROBIOLOGY

Nobel Prize to Waksman

Award in medicine and physiology goes to Dr. Selman A. Waksman, Rutgers University discoverer of streptomycin and other antibiotics. Discoveries revolutionized medicine.

► THE AWARD of the 1952 Nobel prize in medicine and physiology to Dr. Selman A. Waksman of Rutgers University, discoverer of streptomycin and other antibiotics, will give added support to the Institute of Microbiology now building in New Brunswick, N. J.

For Dr. Waksman is a down-to-earth scientist whose greatest desire is to continue investigations upon the microorganisms and their effects that have revolutionized medicine, industry and agriculture. He will add the approximately $33,000 Nobel prize money to his share of streptomycin royalties that he is, for the most part, plowing back into research upon microorganisms.

The faculty of the Caroline Medico-Surgical Institute, Stockholm, which awarded the Nobel prize to Dr. Waksman, cited him for "his discovery of streptomycin, the first effective antibiotic against tuberculosis." The prize will be presented by Swedish King Gustaf Dec. 10.

The development of Dr. Waksman's researches that are honored by the Nobel prize is told in this account officially prepared in connection with the Institute of Microbiology:

Streptomycin, which has proved a miracle drug of even greater potentialities than penicillin, was isolated in September of 1943. But the work which made its discovery possible had been under way in Dr. Selman A. Waksman's laboratory at the College of Agriculture, Rutgers, since 1915.

The search at New Jersey's State University for an antibiotic substance which would have the power to destroy or weaken microbes dangerous to man and animals actually began in 1939. It was preceded by long and valuable work aimed at specific agricultural and industrial problems linked with microbes in the soil—their role in the decomposition of plant and animal residues in nature, their valuable work in making compost, in providing the necessary nutriment for the growth of mushrooms, in the manufacture of enzymes, in the production of sulfuric acid, in the ability of microbes to destroy steel pipes.

Underlying all work in antibiotics is the discovery by early researchers that certain varieties of microbes had the power to destroy others. Dr. Waksman had formally explored this phenomenon in its application to human disease in 1932 when, under a grant from the National Research Council, he undertook to study the fate of tuberculosis microbes when exposed to the action of the billions of microbes present in each handful of soil.

In 1939 he sharply altered the line of his former agricultural investigations and set to work on the development of microbial strains which would have therapeutic value for humans and animals. The outbreak of the war helped make his decision, as did the success of a former student and protege, Dr. Rene Dubos of the Rockefeller Foundation, in developing tyrothricin.

Dr. Dubos, who came here from France and was trained at Rutgers under Dr. Waksman, contrived the unbelievable feat of actually training a microbial strain to exist on pneumococcus microbes as food. He also successfully developed a practical method for reducing the antibiotic substances produced by these trained microbes to a powder. His work found immediate practical application in the treatment of various infections in man and in animals.

Dr. Waksman set himself two specific problems. One was to find a microbe with the power to produce an antibiotic capable of interfering with the growth of and destroying the hard waxy water-repellent walled microbe which caused human tuberculosis. The other was to find a microbe capable of destroying pathogenic (dangerous) microbes without harmful effects upon the tissues of the host, namely the human and animal body. Penicillin was discovered in England during the progress of the experiments and showed great power against one of the great microbial groups—the gram-positive forms (capable of being dyed with a certain stain). One of streptomycin's early predecessors of the same general family, namely streptothricin, indicated that it had promise in the other half of the microbial population—the gram-negative organisms.

From the beginning of his work in 1915, Dr. Waksman had taken particular interest in a variety of microbes known as actinomycetes. His work with this particular group of organisms is probably one of the longest continued researches by an individual upon a research project.

The Actinomycetes

When his new line of investigation began, he quite naturally used as laboratory material those organisms upon which he had worked so long. Back in 1915, Dr. Waksman and R. E. Curtis, then working under Dr. Jacob Lipman, isolated *Actinomyces griseus.* From a strain of this organism, now known as *Streptomyces griseus,* came the miracle drug streptomycin.

The diversion above serves merely to

illustrate the interconnections and long history of microbiological research. Though streptomycin was discovered in 1943, the basic knowledge which lay behind its discovery had been accumulating in one laboratory alone for almost 30 years. And its foundation in turn dated back to Pasteur, Koch and even far beyond.

Streptomycin's Predecessors

A year after the work began in 1939, its first result evolved. It was actinomycin, derived from Dr. Waksman's old friends the actinomycetes. It had remarkable properties to destroy microbes, but was almost as efficient at destroying living animals. It could easily have been used as an animal poison. Soon after actinomycin came clavacin and fumigacin. These as well were either too toxic or not active enough.

Rapid progress was made in 1942 when the announcement was made of the discovery of a selective agent which killed many bacteria and slowed to a stop the growth and reproduction of others. Christened streptothricin, it was streptomycin's direct predecessor. Its importance lay in the fact that it showed a murderous preference for gram-negative microbes, thus supplementing the gram-positive killing power of penicillin and tyrothricin.

Streptothricin showed great promise in the animal body. It successfully attacked varieties of bacteria that had resisted other agents and seemed not too toxic. Its bright promise dimmed, however, when it was found to have a delayed toxic effect—it wiped out the disease infection, but, days or weeks later, the animal succumbed to streptothricin itself.

But the trail was growing hot.

Needle in a Haystack

It is worth delaying here for a moment to consider the mathematical odds against emerging with the substance desired. They are beyond calculation. To begin with, the variety of microorganisms is infinite. Every type has its own variants. And every variant in turn can be altered by the tiniest changes in diet, temperature, agitation, or even by the shape of the flask in which it is grown.

As an example, one group of bacteriologists worked without success to duplicate an experiment performed in another country. They followed all directions, with microscopic precision, but never secured the desired result. After numerous attempts, the reason emerged. Specifications had directed growth at "room temperatures." In the country where the experiment had originally been performed, room temperature was a few degrees lower. The characteristics of the bacteria produced were completely different when the temperature was changed by even a few degrees.

Such were the complications that were involved in the search for a strain of microbes which would perform the tasks desired.

Dr. Waksman set in motion two types of exploratory testing. One involved literally starving the bacteria in a sample of soil, then introducing a dangerous bacterial strain. The method, used by Dr. Dubos in "training" bacteria determined whether the soil microbes could learn to exist upon the dangerous strains as food. This is necessarily a slow method.

Simultaneously, he started testing work with agar plates. This involved growing cultures of pathogenic bacteria, then dropping other living organisms (from the soil, manure pile or peat bog) into the culture. If a clear patch developed around the second group, it showed that the newly-introduced microbes were wiping out the hosts in their cloudy culture.

Mathematically it was possible for the endless search and testing to go on for years. Using such methods, he and his student Albert Schatz succeeded in isolating two individual promising strains of *Streptomyces griseus*. One came from the throat of a chicken, the other from a heavily manured field.

Good Against TB

Even more miraculously, the strains were effective on both the problems being attacked—against the armored tuberculosis bacillus as well as the general group of gram-negative types. Amid growing excitement, the tests went from test-tube to laboratory animals—still with almost universal success.

Heavy-yielding, the strains aroused great hopes, but were abruptly checked as the strains became less vigorous and yielded increasingly less streptomycin.

With intuition that came from recognition of the importance of the soil itself as the power plant of all life, Dr. Waksman finally planted these microbes in rich earth in the hope that new generations would regain their parents' strength. They did—and more. Showing their unpredictability, the microbes developed new strains, which were even more active.

But streptomycin was still months away from its first sensational conquests. Thousands of tests were still to be doggedly made. Endless searching went on for better ways to grow and purify and strengthen the product.

Finally tests were made upon live chick embryos and white mice—the Poultry and Animal Husbandy Departments laboratory nearby gave valuable assistance at this point since Dr. Waksman's laboratories did not have the necessary elaborate animal-testing facilities. The delicate embryos and small animals furnished ideal testing ground, both for the ability of the preparation to do its job and also to test toxicity.

Coming through with flying colors, the tests were expanded to baby chicks, guinea pigs, then finally, through commercial laboratories, such as Merck and Co., at Rahway, N. J., where many former Waksman students served, to the clinics.

Merck scientists improved the manufacturing processes still further, built a pilot plant for small-scale manufacture. Then finally, late in 1944, small quantities were released to the Mayo Clinic for tests. Later, as additional quantities from Merck's miniature factory became available, the Army joined the testing work. Other universities and hospitals began to amass test results.

The secret of the miracle drug soon "leaked" out and the discovery of streptomycin and its medical miracles flashed around the world.

But streptomycin is not the end of the road. It has been followed by new antibiotics—grisein, streptocin, and finally neomycin. The potential of the latter has led to speculation that it may replace streptomycin—certainly it may prove to be an important supplement, since it is highly active against bacterial strains which seem to develop a resistance to streptomycin.

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FREE FALL—The man on the canopy has just dropped a tank with accompanying motion picture camera, shown half way down. During the fall pictures were taken, one of which is shown on the opposite page. The shots demonstrate that an object in free fall has no weight.

Airplane engines today cost about $17 per horsepower.

Winter squash provides good amounts of calcium, iron and phosphorus in addition to several vitamins.

AERONAUTICS

Self-Starter For Jet Engines

➤ OUTSIDE ELECTRIC power to start the engines of jet-propelled airplanes will not be needed with the use of a jet-engine self-starter announced by General Electric, Lynn, Mass.

It means that the field of usefulness of jet planes is greatly expanded. They will be able to land and take off at flying fields where the outside power is not available.

In this development, a small jet engine built into the plane is used to start the main power plant. Two types have been developed. One uses in the starter jet a combination of fuel and compressed air. The other is powered by hot gases resulting from the burning of a solid propellant in a replaceable cartridge.

Several types of self-starters for jet engines have been developed during the past few years, but none seem to be successful enough to warrant their general use. The type of self-starter used in conventional planes cannot be employed because of the large amount of power required.

In the solid propellant system, developed by G.E., the energy for the starter is provided by the burning of a solid fuel contained in a breech. A fast-burning charge, looking much like an artillery shell, is inserted in the breach and ignited electrically.

In the air-fuel system, pneumatic methods are employed. The pneumatic system can be charged on the ground from air bottles, and in flight from an engine-driven compressor. Approximately five pounds of high-pressure air is used per start. The air enters a combustion chamber through a valve. There it is mixed with jet fuel from a pressurized one-quart bottle. The mixture burns and operates the starter jet which in turn starts the main engine.

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WEIGHTLESS—This tank photographed during a free fall was weightless as the shot was made. Bubbles from the dry ice at the bottom of the tank remain suspended in the water. The camera which took the photograph was fastened to the other end of the same board that carried this tank.

PHYSICS

H-Bomb Already Tested?

American people have received only rumors, but hydrogen bomb broadcasts its own official report in the form of microscopic radioactive particles carried by winds.

➤ JOSEPH STALIN may already be studying a report on the first explosion of a hydrogen bomb at Eniwetok Atoll in the Pacific.

It is certain he will know about the first H-bomb explosion long before the American people will. All the American people now know is that there are rumors the first H-bomb will be tested at Eniwetok sometime this fall or winter. It might already have been set off.

Stalin will know about it not through any elaborate spy system, nor through agents who might have infiltrated the Joint Task Force conducting the Eniwetok tests. None of this cloak and dagger stuff is necessary. An H-bomb explosion sends thousands of microscopic radioactive particles high into the air. From there they are carried by the winds all around the world. Delicate instruments, sent up by high-flying balloons, or flown up in airplanes, can detect these particles. Detailed analysis of the particles can tell not only whether an A-bomb or an H-bomb has been exploded, but also something about the precise composition of the bomb.

For greater efficiency in the analysis, perhaps Stalin has a submarine stationed somewhere in the thousands of miles of empty Pacific ocean between Eniwetok and the west coast of the American hemisphere. Balloons which automatically send back reports of radioactivity in the sky could be launched from the submarine.

Of course, the reverse picture is true as well. American high government officials will have a report of the first Russian H-bomb explosion a few days after it happens. They have to wait only until the wind currents carry the radioactive particles to the nearest detecting stations in the free world.

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NUTRITION

Reducing Diet Dangers

➤ THE PSYCHOLOGICAL approach to weight reducing has some danger, Dr. Ruth M. Leverton of the University of Nebraska warned at the meeting of the American Dietetic Association in Minneapolis, Minn.

The danger is that it may help people diet too much.

Inability to stay on a reducing diet formerly safeguarded people from permanently injuring their health by long periods on grossly inadequate diets, Dr. Leverton pointed out.

"We can no longer depend on this safeguard," she stated. "By receiving help in understanding some of their emotional problems they may be able to stay on dangerously inadequate reducing diets until their health fails."

An outstanding requirement of a good reducing diet, she said, is that it will replace faulty food habits with good ones which will lead the patient to choose the kind and amount of food that will meet his nutritional needs.

Reducing diets, "generally speaking," are most likely to be deficient in calcium and riboflavin because they do not include enough milk, Dr. Leverton criticized.

Next most likely deficiencies are protein and vitamin B-1 because of too skimpy servings of meat and milk and enriched bread and cereals. Most reducing diets call for so much in vegetables and fruits that they usually supply plenty of vitamin A and vitamin C.

In general, she said, reducing diets come from one of four sources:

1. Figments of unbridled imaginations, untested and uninhibited by scientific knowledge.

2. Accumulations of both sound and "screw-ball" ideas which happened to produce the desired results and therefore are being promoted.

3. Sound ideas leading to careful and intelligent planning of diets.

4. The same as the third, but with one addition—organized scientific testing of the diet using as subjects a group of overweight people.

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PHYSICS

Ancient Shells Test Older Than Charcoal

➤ SHELLS FROM ancient seashore places of human living give evidence of being a couple of thousand years older than charcoal of campfires analyzed by the same radiocarbon dating method.

Scientists are puzzling out this discrepancy because they believe that shells and charcoal are really the same age.

Because radioactive carbon 14 is being constantly formed in the high upper atmosphere by cosmic ray bombardment of nitrogen, a convenient method of dating organic or carbon-containing materials was discovered a few years ago. Materials up to 30,000 years old can have their ages determined with an accuracy of several hundred years.

The radiocarbon dating investigators of Columbia University's Lamont Geological Observatory at Palisades, N. Y., have run determinations on archaeological samples from Peru, California, Japan and the Aleutions and found that shells there have lower amounts of radiocarbon, which means that their carbon is more ancient.

About a year ago Dr. J. Laurence Kulp, leader of this group, found that deep ocean water is about 1,700 years old, thanks to extremely slow oceanic circulation from the arctic regions. His explanation of the seemingly older shells is that they were formed in coastal areas with abrupt, deep troughs offshore. They seem to be old because they were made with ancient water from the ocean depths.

In the Columbia group reporting in *Science* (Oct. 17) are, besides Dr. Kulp, Lansing E. Tryon, Walter R. Eckelman, and William A. Snell.

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ENGINEERING

Welded Construction Now Used for Bridges

➤WELDING IN bridge construction, replacing the use of rivets and bolts, was highly recommended to the American Socitey of Civil Engineers meeting in Chicago by Leonard C. Hollister of California's Division of Highways.

Welded joints are highly satisfactory, he indicated. Welding makes a saving in the amount of steel required. The greatly increased use of this type of joint, in both bridges and buildings, is due to the increased knowledge of physical and chemical phenomena surrounding welding of structural steel, along with great improvement in equipment and technique.

Mr. Hollister called welding one of the major tools in the hands of the structural engineer. A few years ago, welding on major buildings and bridges was limited to secondary details. Today, large bridges and some buildings are using welding to fabricate not only main stresses carrying connections and splices, but also heavy girders and column sections from rolled plates.

Bridge designers of today should be a combination of engineer and artist, the civil engineers were told by David B. Steinman of New York, a well-known bridge designer. Tomorrow's bridge designers must have not only a thought to utility, but also an eye for the esthetic, he said.

During the past 25 years new attention has been concentrated on beauty in bridges, he stated. New goals of artistic design have been achieved through beauty and harmony of composition, beauty of line, form and proportions, through color and illumination. He predicted that "painting with light" will be an integral part of design. With phosphorescent color and fluorescent radiance, rainbow bridge spans will be arcs of radiant glow at night.

Science News Letter, November 1, 1952

INVENTION

Cigarette Case Time Lock Reduces Smoking

➤ CIGARETTE CASE with a time lock on it to prevent the owner from smoking too much has been invented.

There is a watch mechanism in the bottom of the case which keeps it locked for regular periods of time determined by the smoker. By this method, says the inventor, "the smoking habit of the individual may be reduced."

The case looks like an ordinary cigarette case, built to hold one pack. There is an attachment from the watch works in the bottom to the cover at the top. The watch movement is stopped while the case is open so that the time interval cannot be shortened by keeping the case open.

Nothing is said in the patent about methods to prevent an owner of one of these cases from cadging cigarettes from his friends.

The inventor is Garrett H. Harris, Jackson, Miss., and he received patent number 2,613,527.

Science News Letter, November 1, 1952

METALLURGY

Holes in Castings Filled by New Resin

➤ MICROSCOPIC HOLES in metal castings that wreak havoc with foundry economics now can be filled by a new process that should cut production costs considerably.

A new type of synthetic resin developed at Polyplastex International, Inc., New York, N. Y., combines with heat, vacuum and pressure to seal the tiny holes. The new sealing process does away with some of the disadvantages produced by other sealants now being used to salvage unsatisfactory castings.

After a heat treatment, the resin changes into a solid of "excellent physical and chemical properties." It fills all the tiny holes and does not shrink upon cooling, company officials reported.

Science News Letter, November 1, 1952

IN SCIENCE

ENGINEERING

Machines Not Human; Don't Make Decisions

➤ JUST HOW "human" are these new electronic computing machines that seem to do everything but put out the cat?

Not as human as people are led to believe, protests Reginald O. Kapp, of Croydon, England, in a simmering letter to the British science journal, *Nature* (Sept. 27).

It is all a matter of language, Mr. Kapp argued. Records on the machines are called "memories," he said, and simple codes are termed "machine language." What is done to the machines by the operator is now called "teaching." "In engineering, the words 'setting' or 'adjustment' have the same meaning. Why not use them?" he asked.

Perhaps worst of all, wrote Mr. Kapp, a predetermined sequence of events in an electronic computator has been called a "decision" of the machine. Careful scientists do not admit that lower animals make decisions—much less a pile of machinery, he concluded icily.

Science News Letter, November 1, 1952

AERONAUTICS

Delta-Wing Planes Go Into Production

➤ DEFENSE AIRPLANES of the delta-wing type are soon to be added to the interceptors of the U. S. Air Force. A production order for an undisclosed number has been placed with the Consolidated-Vultee Aircraft Corporation, San Diego, Calif.

It was four years ago that the first delta-wing plane made its initial flight. Consolidated-Vultee was the designer and constructor. The plane now under order is an improved version of the original. In this four-year period, other airplane manufacturers, both here and in England, have developed planes of the same general type.

The plane gets its name from its wing surface, which is triangular like the delta of the old Greek alphabet. The body, or fuselage, extends along the center of the triangle and projects far to the front. This leaves the leading edges of the wing swept-back from the usual right angle position by an angle of approximately 60 degrees.

The delta-wing conformation was developed for high speed. These new interceptors are capable of very high speeds at high altitudes, it is claimed. Officially they will be known as the F-102. They have no tailpiece, but do have a vertical fin-rudder to give directional control and stability.

Science News Letter, November 1, 1952

ENCE FIELDS

MEDICINE

Hormone-Like Compound May Be Cancer Clue

➤ A NEW estrogen-like compound has been isolated at the University of California at Los Angeles School of Medicine and may be a clue to determining the role of certain hormones in the body and their relation to cancer.

The discovery was made by Dr. Josephine Garst, assistant research physiological chemist, in a study supported by the Damon Runyan Memorial Fund.

"The compound is apparently related to certain female hormones known as estrogens and may be a product of their metabolism," says Dr. Garst. "Estrogens are necessary in the development of secondary female sex characteristics. They also exert an influence on both skin and skeletal structure.

"There is reason to suspect that these hormones are related to cancer and other pathological conditions. The incidence of cancer is high in tissues which are intimately connected with the action of estrogens, for example—the breast and uterus."

Science News Letter, November 1, 1952

ELECTRONICS

Radio Interference Problems Still Unsolved

➤ STATIC HAS been crackling in radio listeners' ears ever since the early days of crystal radios. But aside from jiggling the cat's whisker for a better connection, little has been done about the nuisance.

Carleton F. Maylott, Bendix Aviation Corporation engineer, told delegates to the American Institute of Electrical Engineers meeting in New Orleans that control of radio interference is too unscientific in method.

The whole problem has been clouded by trade secrets, by poor dispersal of knowledge concerning radio interference control, and by pride in personal and group opinions of what to do about it. Great differences still exist between experts as to the best ways of limiting or controlling it.

"Test equipment, methods and specifications are not yet standardized, suitable and scientific," he said. "The situation approaches chaos and can only be rectified by improved organization."

Regulations already exist for certain static-causing electrical devices. The Federal Communications Commission may add more regulations to its list in the future, however, Mr. Maylott warned, if manufacturers do not take corrective steps on their own.

In addition to man-made static, other radio interference comes from atmospheric disturbances, cosmic noises, poor electrical connections, wires and vacuum tubes.

Interference can be cut down by shielding radio receivers, by eliminating electrical "leaks" and static discharges due to friction in machinery, and by cleaning electrical contacts. Appliances that create static also should be replaced with non-interfering ones, he said.

Science News Letter, November 1, 1952

AGRICULTURE

World Grain Crop Reaches Record High

➤ THERE WILL be more bread for the world's hungry mouths this winter. World production of wheat and rye, the principal bread grains, will reach a record peak of 258 million short tons in the 1952-53 season, the U. S. Department of Agriculture reports, (*Foreign Agriculture*, Oct.).

This year's grain harvest should be 10 million tons greater than in the previous record year, 1937-38. A tremendous increase in wheat production, especially in North America, is responsible for this optimistic estimate. Rye production may drop somewhat from the preceding year.

Science News Letter, November 1, 1952

NAVAL ENGINEERING

Now Warfare Demands Smooth-Sailing Ships

➤ WITH CARRIER-BASED airplanes playing an increasingly important role in modern warfare, the Office of Naval Research, through a Stanford University research team, is intensifying its efforts to find ways of preventing ship roll.

Ship roll presents one of its biggest hazards to airmen who must land their planes upon the tossing decks of aircraft carriers.

Smooth-sailing ships no longer are a luxury in this day and age, report Joseph H. Chadwick and Albert J. Morris, both of whom are working on the ship stabilization program. Stringent naval requirements now make even-keeled ships a necessity.

Besides making stomachs flip-flop, roll cuts the effective speed of a ship. It also makes it difficult to fire big guns with pinpoint accuracy. It complicates the antenna mechanism of vital radar sets which must sweep the skies from an even keel.

The scientists suggest that delicate instruments be arranged to measure roll angle, roll velocity and roll acceleration. As the ship begins to roll, the instruments would control anti-roll fins outside the ship.

Fluids also can be pumped from one side of the ship to the other to help offset the rolling effect. Such a system was developed in 1938 and tested by the Navy briefly before America entered World War II.

An efficient stabilizing system should be able to hold ship roll to about one degree, the men predict.

Science News Letter, November 1, 1952

METEOROLOGY

Easily Constructed Device Makes Clouds in House

➤ YOU CAN now make clouds right in your own home. However, the designers of the cloud-maker do not guarantee a silver lining.

The cloud-maker has been built in the Weather Bureau's Physical Research Section. It is described as the "first continuous and sustained source of clouds for the laboratory," by B. B. Phillips, one of the two meteorologists who constructed it. The other is R. H. Woessner.

All you need is a tin can to hold ice, a section of pipe with hot water circulating in it, a mixing chamber, an aging chamber and ducts to connect them all up. Air from the room is blown through the ice into the mixing chamber. More room air is blown into the mixing chamber through ducts on top of the hot water pipes. The mixture of hot and cold air forms the cloud, which then moves through another duct into the aging chamber. By the time the cloud droplets have moved to the top of the aging chamber, they become large enough to approximate a real cloud.

The two weathermen use a 20-gallon barrel for their ice and a 50-gallon barrel for their aging chamber, but Mr. Phillips said there was no bar to constructing a much smaller model. Anyone could make one in his basement, he said.

The big model is being used by weathermen to study how cloud droplets are formed, to learn something about atmospheric electricity and other physical facts about clouds. The laboratory model is described in the *Journal of Meteorology* (Oct.).

Science News Letter, November 1, 1952

AERONAUTICS

Helicopter Spraying Fights Forest Insects

➤ NEW SPRAY equipment is putting the helicopter in the front line of our agricultural defense just as this type of aircraft has become an essential in Korea.

The hovering sprayer can do jobs that no other aerial or ground spray machinery can accomplish, the U. S. Department of Agriculture and the Connecticut Agricultural Experiment Station have determined.

Helicopters can hover over normally inaccessible forest areas, covering them with insecticides to reach for insects that hide in bark crevices. They can fight mosquitoes, pests in cranberry bogs, place hormone sprays on orchards and weed-killers on fields with accuracy impossible with even slow airplanes.

The two 25-gallon tanks of spray carried are centrifugally pumped and atomized by both the air from the helicopter's engine fans and the engine exhausts. The revolving blades of the helicopter rotor waft the spray downward toward the ground.

Science News Letter, November 1, 1952

PUBLIC HEALTH

Polio Protection Progress

New vaccine made with attenuated virus gives promise of being effective and gamma globulin from human blood shows up well on mass trial.

Hope grows that children in the future can be protected against the crippling and killing disease, infantile paralysis. On this and the facing page is the latest budget of good news.

Last week (SNL, Oct. 25) an experiment was reported indicating that a vaccine could be given by mouth to protect against polio.

PUBLIC HEALTH

Gamma Globulin Halves Chances of Paralysis

➤ GAMMA GLOBULIN from human blood can more than cut in half the likelihood of children's getting paralytic polio. The protection it gives lasts at least five weeks and is effective against all three known polio viruses.

These results from trials involving 55,000 children were announced by Dr. William McD. Hammon of the University of Pittsburgh at the meeting of the American Public Health Association in Cleveland, Ohio.

The trials were made in Harris County, Texas, and Woodbury County, Iowa-Dakota County, Nebraska, this past summer and in Provo, Utah, in the summer of 1951.

Of all the children given injections, 90 developed paralytic polio. Of these, 26 were children who got gamma globulin and 64 were children who got a harmless, inactive gelatin injection. This gelatin was given to half the children in the trials, but no one knew until results were tabulated which child got gelatin and which gamma globulin.

The difference between the two groups is "statistically significant" in showing the effectiveness of gamma globulin for protecting against paralytic polio, Dr. Hammon said.

In the first week following the injection, almost as many cases occurred in the gamma globulin group as in the gelatin, or control, group. But the cases in the gamma globulin group were mild and within 30 days half the children had recovered completely. None in the control group had recovered within 30 days.

During the second week the difference was marked. Only three children in the gamma globulin group got paralytic polio compared to 23 in the control group. From the second through the fifth week only six cases occurred in the gamma globulin group, but 38 in the control group.

The gamma globulin was furnished by the American Red Cross. It was prepared from blood collected during World War II from tens of thousands of blood donors all over the country. It is the first material that has been scientifically proved to be effective in preventing human paralytic polio.

The present supply of this material for polio prevention is extremely limited and completely inadequate to meet the expected needs, Dr. Hammon said.

Enough for "reasonable use" will be available, Dr. Hammon believes, if public cooperation in giving blood comes up to the cooperation he found in making the field trials of the material for polio prevention.

These field trials, largest in medical history, were made possible by a grant of $1,000,000 in March of Dimes funds from the National Foundation for Infantile Paralysis.

Questions still to be answered about gamma globulin as a polio preventive are: Is protection good for only five weeks? Can this period be extended by increasing the dose or by a second injection? And, most important of all, does gamma globulin let the child get a harmless, unapparent polio infection that will give him permanent immunity to the disease?

Associated with Dr. Hammon in the trials and report of them were Drs. Lewis F. Coriell of the Camden, N. J., Municipal Hospital, Paul F. Wehrle of the U. S. Public Health Service, Christian R. Klimt, Rockefeller Foundation fellow, and Joseph Stokes, Jr., of the Children's Hospital and University of Pennsylvania, Philadelphia. Local doctors and nurses in the test areas assisted Dr. Hammon's test teams in the trials.

Complete details of the trials appear in a report in the *Journal of the American Medical Association* (Oct. 25).

Science News Letter, November 1, 1952

STAINED CELLS AND BRAIN CELLS:

The word cell means literally, "an empty space." And that is what the brain of the beginning student is likely to be if he does not learn what, biologically, a cell really is. All students, whether or not they intend to be professional biologists, should have a chance to study a variety of cells and tissues, living and preserved. In other words, comparative histology. Because cellular biology is fundamental to all the sciences, including the study of cancer, cardiac lesion, and arteriosclerosis.

We can supply, besides the conventional types of slide materials, some that are not readily obtainable elsewhere.

THE AGERSBORG BIOLOGICAL LABORATORY
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PUBLIC HEALTH

Vaccination Against Polio Passes Satisfactory Test

➤ A NEW vaccine against poliomyelitis has now had its first trial on children. Results which can be called definitely gratifying were reported by Dr. Howard A. Howe of Johns Hopkins University, Baltimore, at the meeting of the American Public Health Association in Cleveland, Ohio.

The vaccinated children did not get poliomyelitis, but this is not what showed the value or promise of the vaccine. The children were specially picked because there was almost no chance of their being exposed to polio.

They were vaccinated in a test to answer this important question: Do human beings respond in the way chimpanzees and monkeys do to vaccination against polio?

The answer is Yes. As a result, Dr. Howe and associates and the National Foundation for Infantile Paralysis, which helped support the study, are encouraged to go ahead in an effort to make a still better vaccine and to find a way to produce it in large quantities.

There is hope now, however, that this time the dream of vaccination against poliomyelitis, or infantile paralysis, is really coming true. Then it may be possible to give children lasting immunity to the disease instead of the temporary immunity hoped for from current trials of blood's gamma globulin.

Vaccines against polio are not new. In 1935 and 1936 anti-polio vaccines were made and given to children during an epidemic. One of these was made with living polio virus. Some of the vaccinated children got infantile paralysis and it was impossible to say that these cases had not been caused by this vaccine.

The other vaccine was made from polio virus treated with formalin to destroy its power to cause disease. This vaccine seemed safe enough, but no adequate tests of its effectiveness were carried out.

In those days scientists did not have as good ways to measure protection against polio as they have now, and they did not know that there are three different types of polio virus. Vaccine made from one type will not protect against the others, at least in laboratory experiments. Dr. Howe's vaccine is made to protect against all three types, Lansing, Leon and Brunhilde. The viruses in it are treated with formalin so they will not cause infection, though they keep their power to immunize.

Knowing the measure of a vaccine's protective power against polio is not just a

matter of vaccinating a group of children and seeing whether or not they get the disease. Enormous numbers of children are exposed to polio every year, actually become infected, yet never get sick, much less paralyzed. For every person, child or grown-up, paralyzed by polio, there are at least 100 to 1,000 infected with the virus who escape paralysis and even recognizable sickness.

The reason for this is that a little of the virus, when it gets into the body, mobilizes the body's defensive forces. Some of the defenders are substances called antibodies. A large amount of virus may overwhelm the body's defensive forces, and in such a case, the person attacked gets sick with infantile paralysis.

Antibodies cannot be seen. To tell whether you have any polio antibodies in your blood, scientists would mix some of your blood serum with live polio virus and inject this into a mouse. If the mouse did not get polio, though the same amount of polio virus alone gave the disease to its sister mouse, it would show you had polio antibodies in your blood.

Fifteen years ago, this test could only be made on monkeys, which are expensive animals compared to mice. Now the neutralization test, as it is called, can be made on mice for one of the three polio viruses, the Lansing strain. The neutralization test can also now be carried out with all three virus types in test tube cultures of monkey testes and kidney.

Besides telling whether you have polio antibodies, the test can be made to tell how much antibody, thus giving an idea of the ability of your blood serum to neutralize the virus and thus protect you from the disease. This is done by seeing how much your serum can be diluted and still neutralize a given amount of polio virus. Scientists call this the titer of antibodies in your blood.

Fifteen years ago, when scientists were working on polio vaccines, they did not have such good methods for measuring the titer of polio antibodies. So, as Dr. Howe explained, the whole problem had to be studied over again.

For the trials in humans, six little boys and girls between the ages of two and five were chosen. These six and five others who were not vaccinated were inmates of Rosewood Training School, at Owings Mills, Md., near Baltimore. The children were low grade idiots or imbeciles who never left their beds, never played with other children, not even their ward mates, and almost never had any visitors. They were chosen for the study because it was thought they were least likely to have any contacts through which they might develop antibodies by natural exposure to polio virus other than the inactivated virus in the vaccine. And they were vaccinated in 1951, when there was very little polio in the region outside Rosewood. In Baltimore City and County from June through December of that year there were only 26 cases of infantile paralysis with paralysis, the lowest number in eight years.

At about the same time that the children were vaccinated, five chimpanzees were given the same vaccine. Both children and chimps showed a rise of about the same degree in antibody level following the vaccination. Although the vaccine was made from all three types of polio virus, the antibody levels to the different strains were tested. For the Brunhilde strain, the response was not as good as for the Leon and Lansing. Dr. Howe hopes the vaccine can be improved in this respect.

Although the titers were low in the vaccinated children, it is impossible, Dr. Howe says, to state that they are too low to protect against paralysis. The same levels are enough to protect monkeys against paralysis, and much lower levels can be found in as much as a fourth of the adult population. Yet all of the latter are members of a group which is statistically immune, since on the average only two out of every 100,000 adults get the paralytic form of the disease in a whole year's time.

Some other chimps in the study got the vaccine mixed with an adjuvant oil. Within recent years scientists have found that virus vaccines can be made more effective by addition of such oils. The polio vaccine made with an adjuvant was more effective in raising the antibody titer in the chimps. Dr. Howe plans further study of this with the hope of being able to increase the vaccine's efficiency for humans through the use of an adjuvant.

Meanwhile, it is now known that vaccine trials on chimpanzees can be used as a guide to production of a vaccine that will be effective for protecting humans and in tests to determine how long it will protect, what dosage must be used, whether "booster" shots should be given and when, and for answering all the other questions doctors must have answered before trying a new preventive method for children on a large scale.

Science News Letter, November 1, 1952

NUTRITION

Proper Cooking Retains Nutritive Values of Meat

➤ MORE BEEF is coming on the market and housewives will be buying and using more of this meat. Even so, the thrifty ones will want to buy and cook it so as to make the most of its nourishing values. Beef and other meats are an important source of proteins, the essential body components used for building and repairing body tissue. The lean of beef is also a valuable source of B vitamins and of the minerals, phosphorus and iron. Beef fat contains a small amount of vitamin A.

Cooking, other processing and home and commercial storage bring about nutritive losses in meat, U. S. Department of Agriculture experts point out. In a new bulletin on beef (USDA-A1B84, Govt. Printing Office, 15 cents) the Department's Bureau of Human Nutrition and Home Economics gives the following information:

Meat shrinks when cooked; it loses water through evaporation, and some of the fat, mineral matter, B vitamins, and protein in the drippings. Heat causes some destruction of vitamins, mainly thiamine. More thiamine is destroyed by long cooking, such as braising, than by shorter cooking methods. When cooked beef is kept warm for serving, there is further loss of this vitamin.

Under usual conditions, losses of nutritive value are not great enough to be a cause for concern, although it is advisable to keep them to a minimum.

Freezing does not alter nutritive values, but losses result if drip from thawed meat is not used.

A 3-ounce serving of cooked beef chuck (bone out) provides a little less than one-third of the protein and almost one-fourth of the iron and niacin recommended by the National Research Council as the daily allowance for a physically active man.

Liver, kidney, and heart contain as much protein as the muscle meats and are rich in the B vitamins and iron. Liver is an excellent source of vitamin A and a good source of ascorbic acid. It is important as a blood builder because of its iron and copper content.

Science News Letter, November 1, 1952

Symptoms of diseases such as high blood pressure, diabetes and arteriosclerosis show up in the veins, arteries and capillaries of the eye's *retina* long before more obvious symptoms appear.

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Books of the Week

For the editorial information of our readers, books received for review since last week's issue are listed. For convenient purchase of any U. S. books in print, send a remittance to cover retail price (postage will be paid in U. S.) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C. Request free publications direct from publisher, not from Science Service.

AGRICULTURAL ORIGINS AND DISPERSALS—Carl A. Sauer—*American Geographical Society*, 110 p., illus., $4.00. A geographer presents his theories of the beginnings of agriculture, milking, and domestication of herd animals.

AUDUBON'S BUTTERFLIES, MOTHS, AND OTHER STUDIES—Alice Ford, Ed.—*Studio and Crowell*, 120 p., illus., $5.75. First publication of some original paintings by Audubon presented to Mrs. Charles Basham in 1824 and handed down in her family since.

BENCH METAL WORK—Robert E. Smith—*McKnight & McKnight*, 72 p., illus., paper, $1.00. An elementary text on the use of hand tools in metalworking. Revised edition of the title "Units in Bench Metalwork."

CAREERS IN CHEMISTRY AND CHEMICAL ENGINEERING—Walter J. Murphy and others—*Fisher Scientific Company*, 94 p., illus., paper, free upon request to publisher, 717 Forbes Street, Pittsburgh 19, Pa. This is the same excellent booklet previously available through the American Chemical Society.

THE CHEMISTRY AND PHYSIOLOGY OF THE NUCLEUS: Experimental Cell Research, Supplement 2, 1952—V. T. Bowen and M. J. Moses, Eds.—*Academic Press*, 402 p., illus., $7.00. Papers presented at the Brookhaven symposium on nuclear chemistry and biology together with the recorded discussions.

CONTEMPORARY ETHIOPIA—David Abner Talbot—*Philosophical Library*, 267 p., $4.50. The American editor of an Ethiopian newspaper writes of the progress made in that country since Haile Selassie became emperor.

CORE CURRICULUM DEVELOPMENT PROBLEMS AND PRACTICES—Grace S. Wright—*Govt. Printing Office*, Office of Education Bulletin 1952, No. 5, 104 p., paper, 30 cents.

CONTRIBUTIONS TO THE ANTHROPOLOGY OF THE FAIYUM, SINAI, SUDAN, KENYA—Henry Field—*University of California Press*, 352 p., paper, $4.00. Because the author's survey from Transjordan to the central Caucasus had indicated physical and cultural links with Egypt, it was desirable to compile new data there and comparative material for the Nile Valley and Sinai.

FEDERAL FUNDS FOR EDUCATION 1950-51 and 1951-52—Clayton D. Hutchins and Albert R. Munse—*Govt. Printing Office*, Office of Education Bulletin 1952, No. 12, 92 p., paper, 30 cents. About six per cent of the Federal budget is spent for public education.

FINAL REPORT ON ROAD TEST ONE—MD.: Effect of Controlled Truck Axle Loadings on Concrete Pavement—Fred Burggraf, Chairman—*Highway Research Board*, Special Report 4, 142 p., illus., paper, $2.25.

GENERAL SHOP ELECTRICITY—A. W. Dragoo and C. B. Porter—*McKnight & McKnight*, 4th rev. ed., 119 p., illus., paper, $1.25. Intended as a text for a shop course, this book gives instructions for projects that would provide fun for hobbyists or utility in the home.

LIBERAL ARTS DICTIONARY IN ENGLISH, FRENCH, GERMAN, SPANISH—Mario A. Pei and Frank Gaynor, Eds.—*Philosophical Library*, 307 p., $6.00. Words used in works on literature, art and philosophy with their equivalents in three other languages.

THE MECHANISMS OF DISEASE: A Study of the Autonomic Nervous System, the Endocrine System and the Electrolytes in Their Relationship to Clinical Medicine—Joseph Stambul—*Froben*, 746 p., $15.00. Gathering together facts about the state of malfunctioning between health and disease during which disease can be fought best.

MILKMAN FREDDY—Elizabeth Helfman—*Messner*, 63 p., illus., $1.50. A story for children portraying daily life on a dairy farm.

MR. WIZARD'S SCIENCE SECRETS—Don Herbert—*Popular Mechanics Press*, 264 p., illus., $3.00. The author of a popular television program here tells his young fans how to perform the "tricks" that are really science experiments.

THE MODAL PERSONALITY STRUCTURE OF THE TUSCARORA INDIANS AS REVEALED BY THE RORSCHACH TEST—Anthony F. C. Wallace—*Govt. Printing Office*, Bureau of American Enthnology Bulletin 150, 120 p., illus., paper, 60 cents. Evidence has been found that the personality structure in aboriginal times was similar to that revealed by the Rorschach today.

PRINCIPLES OF ELECTRICITY—Wendell H. Cornetet—*McKnight & McKnight*, rev. ed., 341 p., illus., $4.00. An elementary text for use in high school, trade school or college.

RALPH J. BUNCHE: Fighter for Peace—J. Alvin Kugelmass—*Messner*, 174 p., illus., $2.75. A biography for young people telling about the adventurous and important life of the Nobel Prize winner, grandson of a slave.

SIGMUND FREUD—Rachel Baker—*Messner*, 201 p., $2.75. A biography for young people. Contains a glossary of Freudian terms.

SOIL MICROBIOLOGY—Selman A. Waksman—*Wiley*, 356 p., illus., $6.00. The soil under our feet is not a mass of dead debris; it is teeming with life. Upon the living microorganisms depend soil fertility. By the winner of this year's Nobel Prize.

STATISTICS OF HIGHER EDUCATION: Receipts, Expenditures and Property—Henry G. Badger and Maude Farr—*Govt. Printing Office*, Office of Education Biennial Survey of Education in the United States, 1948-50, Chapter 4, Section II, 61 p., paper, 20 cents.

STEPPING STONES TO THE SOUTH POLE—J. R. Nichol—*Library Publishers*, 199 p., illus., $3.75. An account of the series of adventurous exploration voyages to the Antarctic.

SUNSET PRUNING HANDBOOK—Roy L. Hudson—*Lane*, 80 p., illus., paper, $1.50. Help for the home gardener in putting his place in good shape for the winter.

THE TEACHING OF GENERAL BIOLOGY IN THE PUBLIC HIGH SCHOOLS OF THE UNITED STATES: An Inquiry into Offerings, Enrollments, Course Organization, Facilities, Equipment and Expenditures, 1949-50—W. Edgar Martin—*Govt. Printing Office*, Office of Education Bulletin 1952, No. 9, 46 p., paper, 20 cents. This subject is taught in 95% of the public high schools surveyed.

THE UNIVERSE WE LIVE IN—John Robinson—*Crowell*, 252 p., illus., $4.50. Creation, it is indicated, is a continuous process and much remains to be discovered about the great universe around us.

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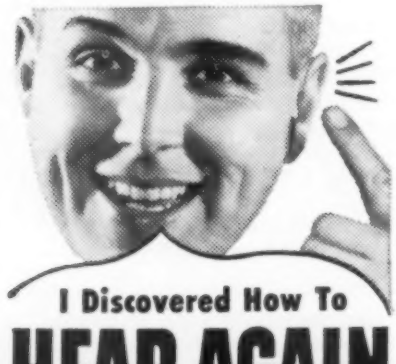

I Discovered How To

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STATISTICS

Independents Key Nov. 4

Survey of voting population shows that Republican party appeals most to educated, prosperous and middle-aged who tend to be independent; needs more to win.

▶ THE REPUBLICANS have a better chance of appealing to the so-called "independent" vote, but they need many more independents than do the Democrats to win.

This is the implication of a detailed study of the independents in the voting population recently completed at the Social Research Center of the University of Michigan. The study was based on a nation-wide sampling of the 1948 electorate. It was prepared by Dr. Samuel J. Eldersveld.

The figures, the study says, "suggest two important strategic facts: the party which has most appeal to certain social and demographic groups—the educated, prosperous, middle-aged—will presumably have more success in attracting independents; the party, on the other hand, which secures the support of other groups—the poorly educated, those of low economic status, the young—will find less trouble in maintaining partisanship."

Independent voters were divided into seven categories, according to how accessible they are to appeals to vote. On a theoretical formula, the study shows, the Democrats need concentrate only on the most accessible of these categories, while the Republicans will have to dip farther into the barrel to win.

According to the formula, in 1948, 17.5% of the adult population eligible to vote were definite Democrats who always vote. Another 10% were independents who always vote and who tend to be Democrats. This makes 27.5%, or more than half of the 52% who actually voted for either of the two major parties. But for the Republicans to have won in 1948, on a theoretical basis, they would not only have had to get the votes of the definite Republicans who always vote and the independents tending Republican who always vote, but also the votes of all the definite Republicans who usually vote.

What actually happened in 1948? The report says this: "The 1948 election may well have been decided for the Democrats by their surprising success in getting out the vote of the independents tending to be Democrats who admit to voting infrequently. Most of these were late deciders."

This represented 2,400,000 votes, or 250,000 votes more than the popular vote difference between the two major parties. The Republicans failed in getting out the independents who tend Republican and who infrequently vote. The Republicans received the large bulk of their votes from two groups: definite Republicans who always vote, and independents who always vote.

The independent vote is estimated in the study as being more than one-third of the potential electorate. Two-thirds of these independents are accessible to partisan appeals and vote quite regularly.

The most accessible independents are those who always vote, who tend to be in favor of one of the two parties and who make their voting decision late in the campaign. This group is 18.5% of all independents, 13% of all regular voters and 7% of all eligible adults. The least accessible, according to the study, are the apathetic. They never vote. This group is just about half the size of the most accessible group.

"It seems clear," the study says, "that the chances of both parties must be computed in terms of the voting behavior of these independents. Not all independents, but certainly a few categories of independents, do indeed hold the balance of electoral power."

The report was made to the American Political Science Association.

Science News Letter, November 1, 1952

Questions

ENGINEERING—How did engineers use radioactive cobalt to clean out a pipe? p. 276.

• • •

MEDICINE—How does the fear of cancer act to save lives? p. 287.

• • •

MICROBIOLOGY — For what great discovery was the Nobel Prize in medicine awarded? p. 277.

• • •

PHYSICS—How will the world know about the test of the hydrogen bomb? p. 279.
Where is the atomic submarine being built? p. 286.

• • •

PHYSIOLOGY — What discovery promises to save large numbers of people from starvation? p. 275.

• • •

PUBLIC HEALTH—How can children in future be protected from infantile paralysis? p. 282.

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STATISTICS—What proportion of voters are independents? p. 285.

• • •

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PHYSICS

Building Atomic Submarine

Foundation now completed for steel sphere that is to house nuclear power plant. Submarine hull will be built outside and then skidded in.

See Front Cover

► THE SAUCER-SHAPE foundation for the 225-foot steel sphere that is to house a nuclear submarine power plant being built by the Atomic Energy Commission for the U. S. Navy has been completed, and work on assembling the hull of the land-based prototype submarine is underway. The saucer is shown on the front cover of this week's SCIENCE NEWS LETTER.

Known as the Submarine Intermediate Reactor (SIR), this project is under the direction of the Knolls Atomic Power Laboratory in Schenectady, N. Y., operated for the Atomic Energy Commission by the General Electric Company. The reactor, and the sphere enclosing it, are being built on a 4,000-acre site at West Milton, N. Y., about 18 miles north of Schenectady.

The spherical design of the reactor building was adopted to give additional protection to operating personnel and to off-site areas during test operations beyond the many safety controls of the reactor itself.

Similar structures are widely used in the chemical and petroleum industries, but the West Milton sphere will be the largest ever constructed. In the remote event that simultaneously all other controls failed, the resulting release of radioactive material would be contained in the sphere which will have a net "free" space of more than 5,400,000 cubic feet.

The outer periphery of the building will be 706 feet. The sphere will rest on the concrete saucer just completed which is 179 feet in diameter and 42 feet deep. A ring of steel columns set on concrete outside the structure and reaching to the middle of the sphere will give further support to the building. Welded steel plates will make up the skin of the ball. The plates will be hoisted into position by a derrick mounted on top of a temporary central steel tower. The derrick, now in place, reaches up 424 feet above ground level.

Every weld in the structure must be X-rayed to be sure that there are no leaks. To do this on the bottom, a four-foot space is provided temporarily between the base of the sphere and the concrete saucer. After testing is completed, this space will be filled with concrete and aggregate. Inside, the concrete floor on which the reactor will rest will be slightly above ground level and the well of the saucer beneath the floor will be filled with compacted mixture of aggregate and earth. The reactor building will be air conditioned.

As soon as the columns are in place, the first ring of plates will gird the sphere at its center and assembly will proceed both upwards and downwards.

Meanwhile the hull of the submarine will be assembled just outside the building and when the latter is completed and tested, the hull will be skidded into the huge ball through a special wall section and the sphere again sealed.

The Submarine Intermediate Reactor is one of two nuclear science approaches being made to the problem of utilizing atomic fuel for underwater ship propulsion. The other is incorporated in a project at the National Reactor Testing Station in Idaho. The reactor designed for the West Milton site will use liquid sodium metal to take the heat out of the reactor core and into an exchanger or "boiler" where water will be converted to steam. The steam will then drive the turbines that propel the submarine.

Design, testing and scientific support of the SIR comes from the Knolls Atomic Power Laboratory in Schenectady. The Electric Boat Division of the General Dynamics Corporation of Groton, Conn., is erecting the hull and power plant. The sphere-shaped building for the reactor is being built by the Chicago Bridge and Iron Company.

Science News Letter, November 1, 1952

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Do You Know?

A *jet airliner* able to whisk 150 persons daily between London and New York on a "three-hops-a-day" schedule now is on British drawing boards.

The earth's average *population* density is 47 persons per square mile.

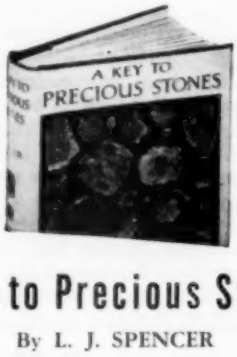
Many of today's flat *wall paints* are easier to apply because of new alkyd resins they contain.

Moles live on a diet of insects and can be somewhat controlled by efficient insect control program; but trapping the moles is the best practical way to get rid of them.

When clothes having *zippers* are sprinkled, then rolled up before ironing, electrolysis sometimes take place between different metals in the zipper which causes enough acid to be given off to stain the cloth brown.

Dairy cows now can be *noseprinted* for positive identification just as human beings can be fingerprinted.

Pleated paper *umbrellas* can be treated with a special vinyl coating that sheds water.



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MEDICINE

Fear of Cancer Saves

➤ WHETHER SMOKING does or does not cause lung cancer, many lives are going to be saved by the current agitation over the subject.

In New York, one of 10 states where a survey is being made on the lung cancer-smoking question, many men have been inspired to see their doctors. As a result, 10 have been found with cancer in an early, probably curable form.

This survey, being made with volunteer workers for the American Cancer Society, is taking a forward-looking rather than the historical, backward-looking direction. In the past, doctors have compared smoking habits of lung cancer patients with patients not having lung cancer. The weakness of this approach is that until a person develops lung cancer, or until he dies, no one can say he is not a lung cancer patient or going to become one. Therefore previous studies do not, in the opinion of some scientists, positively answer the question as to whether smoking causes lung cancer.

So for the past year some 200,000 men aged 50 to 69 years have been questioned about their smoking habits. As these men die, records of the date and cause of death will be collected. From these, Drs. E. Cuyler Hammond and Daniel Horn of the American Cancer Society's statistical staff hope to have an answer to the question.

So far, they find that 18% of the men never smoked, 6% smoked occasionally and 76% are or were regular smokers.

Only 16% of the 50- to 54-year-age group never smoked compared to 23% in the 65- to 69-age group. This may mean that non-smokers live longer or that the habit is growing.

Older smokers show a much greater tendency to reduce or quit smoking than younger men. One-fourth of regular cigarette smokers quit at some time. One-half of cigar and pipe smokers stopped.

Science News Letter, November 1, 1952

PHARMACOLOGY

Vaccine Made By Firm

➤ FOR THE first time, yellow fever vaccine in the United States will be manufactured by a pharmaceutical firm instead of by the U. S. Public Health Service.

The shift to the National Drug Company of Philadelphia was announced in Washington by Surgeon General Leonard A. Scheele of the Public Health Service.

The Public Health Service developed the vaccine and has been sole producer of it for this nation and for all the Americas since 1942. The shift is in line with the policy to turn over to the pharmaceutical industry the manufacture of biological products once large-scale production becomes feasible.

Many pharmaceutical firms were interested in making the vaccine, but National Drug is the only one that can within a reasonable time start producing the vaccine in sufficient quantity to meet the current and stockpile needs of the Armed Services, which are the chief consumers of this product.

Manufacture of the vaccine by the National Drug Company does not alter the regulations governing distribution. All eligible consumers now receiving the vaccine may continue to do so. Clinics issuing yellow fever vaccine certificates are designated by the Public Health Service in accord with the international sanitary regulations of the World Health Organization. Vaccination certificates must be obtained by travelers from a designated clinic in order to be valid for international travel.

In conformance with the Biologics Control Law, the National Drug Company must obtain a license from the Public Health Service before it can distribute yellow fever vaccine of its own manufacture. License requirements provide that a biological product must meet established standards relating to safety, potency, and purity. The National Drug Company is now constructing special plant facilities at Swiftwater, Pa., to produce yellow fever vaccine.

Science News Letter, November 1, 1952

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GENERAL SCIENCE

Science Foundation Opens New Rolls

➤ MORE THAN 500 fellowships for graduate study in the medical, biological, engineering, mathematical and physical sciences will be available to graduate students in 1953-54, the National Science Foundation announced.

Oct. 24 marked the first day during which applications for the 1953-54 fellowship program were received, the foundation announced. The majority of the fellowships will go to graduate students, but a few will be awarded to people who already have a Ph.D. degree. Test scores of scientific aptitude and achievement, academic records and recommendations will figure in selection of applicants.

Applications may be obtained from the Fellowship Office, National Research Council, Washington 25, D. C. Completed applications must be returned by Jan. 5, 1953.

Science News Letter, November 1, 1952

CHEMISTRY

First Total Synthesis Of Cortisone Achieved

➤ TOTAL SYNTHESIS of cortisone, the anti-arthritis hormone chemical, all the way from simple, readily available chemicals to cortisone itself can be done through a 30-step process worked out by Dr. Lewis H. Sarett and associates of Merck and Co., Inc., Rahway, N. J.

The American Chemical Society says this is the first report of the preparation of cortisone in one laboratory by total synthesis through a single series of reactions. The method is described in the *Journal of the American Chemical Society* (Oct. 5).

Science News Letter, November 1, 1952

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Science News Letter, November 1, 1952

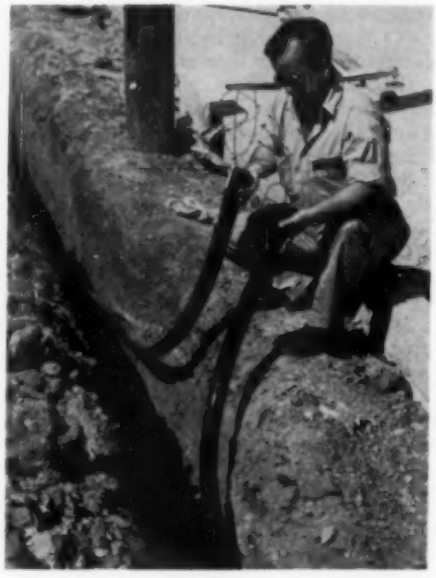
UNDERWATER PUMP, especially good when the water level is 75 or more feet below the ground, is driven by a ¾ or a 1½ horsepower motor. Operating quietly from the depths of the well, the pump requires no priming and is controlled at the ground's surface by automatic instruments.

Science News Letter, November 1, 1952

BATHTUB BACK REST is made of a high quality "quilted" rubber, further padded to provide a comfortable support usable in any type of tub. A matching head rest cradles the neck and is held in place by two suction cups.

Science News Letter, November 1, 1952

PLASTIC CONDUIT for electric power lines now is being used by a Tennessee power company because of its flexibility, ease of installation, corrosion resistance and shatter-proof qualities. Sections of pipe 20 feet long were joined with cement (see photograph). It took 20 minutes to lay 247 feet of the connected butyrate pipe, normally a four-hour job with rigid conduits.



Science News Letter, November 1, 1952

NO-SNAG SINKER for still-water fishing is made of a large wood plug with heavy metallic core. It has enough weight to carry the line out but has enough wood to cause the hook and bait to come to the surface without snagging when reeled in.

Science News Letter, November 1, 1952

PORTABLE oxygen-administering apparatus for athletes helps the heart and respiratory system return to normal 30% faster by supplying oxygen to the athlete after a hard-fought, strenuous game. The athlete puts a facepiece over his nose and mouth and opens a valve. The unit adjusts itself automatically to any breathing pattern.

Science News Letter, November 1, 1952

FINGER-TIP PEN slips over the index finger like a thimble, responding freely to light writing movements of the user. Made of a pleasant-to-touch butyrate plastic, the pen has a lever that retracts its ball point into the barrel for safe carrying. When exhausted, the "ink" cylinder can be replaced in about five seconds.

Science News Letter, November 1, 1952

WATER-PURIFIER unit, developed by the Army, can be flown to combat sites and set up in about 90 minutes. Operating on its own power supply, the purifier removes silt, destroys bacteria and screens out disease-causing organisms. The unit delivers 2,400 gallons of drinkable water an hour.

Science News Letter, November 1, 1952

Nature Ramblings

Beauty Betrayed

➤ FRINGED GENTIANS, through most of their former range in the northeastern states, have become so rare that enthusiastic flower lovers and keen students of botany may go for years without seeing even one of their beautiful blue blossoms.

It is all a result of over-enthusiasm by flower-lovers of a former generation—our grandfathers and grandmothers, who saw no reason for letting a flower stand on its stem if they happened to fancy it and wanted to carry it home and put it in a vase. That's what happened to millions of fringed gentians back in the nineteenth century—they died in parlor vases.

It is a bitter shame that this had to happen, for of all the blue-and-gold beauty that is autumn, no one thing ever stood out with more beauty than the fringed gentian. Both in gracefulness of form and ringing clearness of color, it seems more like a spring flower than one of late autumn.

The four flaring upper ends of its petals, standing out boldly from the green calyx that offers them to the sun, are something for poets to write about. Indeed, one of the best of early American poets, William Cullen Bryant, dedicated one of his finest poems to the fringed gentian.

One reason why the fringed gentian has suffered so badly at the hands of its too-possessive friends is that it depends primarily on seed for its propagation. If you pick the flower you pick next year's gentians, too, and those of many a year thereafter—unless there chance to be some hidden flowers that you have overlooked.

So the best thing to do, if you chance on a few survivors, is to look your fill, but let them alone—and don't tell anyone else of your discovery.

In one part of our country, fringed gentians live and flourish in great abundance. That is in the northern Rockies; in Yellowstone National Park, within easy sight of the tourist highways, there are whole alpine meadows that are blue with gentians in July and August—for these flowers, like all mountain flowers, must come into bloom early to avoid the early winter.

This gentian, of course, is not identical with the fringed gentian of the East. But allowing for its somewhat greater size and sturdiness, it passes fairly enough for a western sister of the flower that Bryant loved.

Science News Letter, November 1, 1952